AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

Claim 1 (Original): A semiconductor laser element having a ridge-stripe structure for confining light in a horizontal direction, the element comprising: a substrate; a first conductivity type lower clad layer formed above the substrate; a second conductivity type upper clad layer formed above the lower clad layer, the second conductivity type being different from the first conductivity type; and an active layer provided between the lower clad layer and the upper clad layer, the element wherein,

a difference in a radiation loss of light between a basic horizontal-lateral mode and a 1st-order horizontal-lateral mode is 10 cm^{-1} or more, the light generated in the active layer, the propagation loss of light directed toward a main side of at least either the lower clad layer or the upper clad layer, the main side being opposite to an active layer side of the lower clad layer or the upper clad layer.

Claim 2 (Currently amended- withdrawn): A semiconductor laser element according to claim 1 ~~having a ridge-stripe structure for confining light in a horizontal direction, the element comprising: a substrate; a first conductivity type lower clad layer formed above the substrate; a second conductivity type upper clad layer formed above the lower clad layer, the second conductivity type being different from the first conductivity type; and an active layer provided between the lower clad layer and the upper clad layer, the element~~ wherein,

a refractive index of at least either the lower clad layer or the upper clad layer of the semiconductor laser element is below an effective index against light in a basic horizontal-lateral mode, and equal to or more than an effective index against light in a 1st-order horizontal-lateral mode, the light generated in the active layer.

Claim 3 (Original): The semiconductor laser element according to claim 1, wherein,

the upper clad layer is provided above a portion of the active layer, and the upper clad layer is at least included in the ridge-stripe structure.

Claim 4 (Original): The semiconductor laser element according to claim 3, further comprising a second conductivity type upper light waveguide layer provided between the active layer and the upper clad layer, the upper light waveguide layer having a stripe-shaped protruding portion, wherein,

the stripe-shaped protruding portion of the upper light waveguide layer is included in the ridge-stripe structure.

Claim 5 (Original): The semiconductor laser element according to claim 4, wherein the lower clad layer, the upper clad layer, and the active layer are made of nitride semiconductors.

Claim 6 (Currently amended): The semiconductor laser element according to claim 5, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 7 (Original): The semiconductor laser element according to claim 6, further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 8 (Withdrawn): The semiconductor laser element according to claim 2, wherein,

the upper clad layer is provided above a portion of the active layer, and the upper clad layer is at least included in the ridge-stripe structure.

Claim 9 (Withdrawn): The semiconductor laser element according to claim 8, further comprising a second conductivity type upper light waveguide layer provided between the active layer and the upper clad layer, the upper light waveguide layer having a stripe-shaped protruding portion, wherein,

the stripe-shaped protruding portion of the upper light waveguide layer is included in the ridge-stripe structure.

Claim 10 (Withdrawn): The semiconductor laser element according to claim 9, wherein the lower clad layer, the upper clad layer, and the active layer are made of nitride semiconductors.

Claim 11 (Currently amended-withdrawn): The semiconductor laser element according to claim 10, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 12 (Withdrawn): The semiconductor laser element according to claim 11, further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 13 (Original): The semiconductor laser element according to claim 1, wherein a refractive index of the lower clad layer and a refractive index of the upper clad layer are different from each other.

Claim 14 (Original): The semiconductor laser element according to claim 13, wherein the refractive index of the lower clad layer is higher than the refractive index of the upper clad layer.

Claim 15 (Original): The semiconductor laser element according to claim 13, further comprising an absorption layer, the absorption layer having an absorption coefficient of 100 cm^{-1} or more with respect to light generated in the active layer, the absorption layer provided at a distance of 0.1 μm or less from a surface of a clad layer, the surface facing a side of the active layer, the clad layer being either the lower clad layer or the upper clad layer and having a higher refractive index than the refractive index of the other clad layer.

Claim 16 (Original): The semiconductor laser element according to claim 14, wherein a refractive index of the substrate is higher than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 17 (Currently amended): The semiconductor laser element according to claim 14, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of

the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 18 (Original): The semiconductor laser element according to claim 17, further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 19 (Withdrawn): The semiconductor laser element according to claim 2, wherein a refractive index of the lower clad layer and a refractive index of the upper clad layer are different from each other.

Claim 20 (Withdrawn): The semiconductor laser element according to claim 19, wherein the refractive index of the lower clad layer is higher than the refractive index of the upper clad layer.

Claim 21 (Withdrawn): The semiconductor laser element according to claim 19, further comprising an absorption layer, the absorption layer having an absorption coefficient of 100 cm^{-1} or more with respect to light generated in the active layer, the absorption layer provided at a distance of 0.1 μm or less from a surface of a clad layer, the surface facing a side of the active layer, the clad layer being either the lower clad layer or the upper clad layer and having a higher refractive index than the refractive index of the other clad layer.

Claim 22 (Withdrawn): The semiconductor laser element according to claim 20, wherein a refractive index of the substrate is higher than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 23 (Currently amended-withdrawn): The semiconductor laser element according to claim 20, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 24 (Withdrawn): The semiconductor laser element according to claim 23, further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 25 (Original): The semiconductor laser element according to claim 1, wherein when a value obtained by subtracting a height of the ridge-stripe structure from a distance between a top of the ridge-stripe structure and the active layer is taken as d [μm], and when a stripe width of the ridge-stripe structure is taken as W [μm], then the d and the W meet the following formula:

$$(2.1 - W) \times (0.1075 - d) \geq 0.0127.$$

Claim 26 (Original): The semiconductor laser element according to claim 25, wherein:

the lower clad layer and the upper clad layer are each composed of an alloy layer containing aluminum atoms; and

when a value obtained by subtracting an aluminum atom content of the lower clad layer from an aluminum atom content of the upper clad layer is taken as Δx, then the Δx and the W meet the following formula:

$$W < 6.1586 \times \Delta x + 1.7625.$$

Claim 27 (Currently amended): The semiconductor laser element according to claim 26, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 28 (Original): The semiconductor laser element according to claim 27, further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 29 (Withdrawn): The semiconductor laser element according to claim 2, wherein when a value obtained by subtracting a height of the ridge-stripe structure from a distance between a top of the ridge-stripe structure and the active layer is taken as d [μm], and when a stripe width of the ridge-stripe structure is taken as W [μm], then the d and the W meet the following formula:

$$(2.1 - W) \times (0.1075 - d) \geq 0.0127.$$

Claim 30 (Withdrawn): The semiconductor laser element according to claim 29, wherein:

the lower clad layer and the upper clad layer are each composed of an alloy layer containing aluminum atoms; and

when a value obtained by subtracting an aluminum atom content of the lower clad layer from an aluminum atom content of the upper clad layer is taken as Δx, then the Δx and the W meet the following formula

$$W < 6.1586 \times \Delta x + 1.7625.$$

Claim 31 (Currently amended-withdrawn): The semiconductor laser element according to claim 30, wherein:

the lower clad layer includes a first conductivity type first lower clad layer, a first conductivity type second lower clad layer, and a first conductivity type third lower clad layer, the lower clad layers deposited in this order~~, the deposition starting~~ from a side of the substrate;

a refractive index of the lower clad layer is a weighted average value of a refractive index of the first lower clad layer, a refractive index of the second lower clad layer, and a refractive index of the third lower clad layer, the weighted average value weighted by each thickness of the first, second, and third lower clad layers;

the refractive index of the second lower clad layer is lower than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer; and

the refractive index of the first lower clad layer and the refractive index of the third lower clad layer are lower than an effective index against light in a basic horizontal-lateral mode, the light generated in the active layer.

Claim 32 (Withdrawn): The semiconductor laser element according to claim 31 further comprising a first conductivity type lower light waveguide layer between the lower clad layer and the active layer, wherein,

a refractive index of the lower light waveguide layer is higher than the refractive index of the first lower clad layer and the refractive index of the third lower clad layer.

Claim 33 (Original): An optical data recording device for recording data in a light recording medium, the data provided in an electrical signal, the device comprising:

a semiconductor laser element having a ridge-stripe structure for confining light in a horizontal direction;

recording light radiating control means for allowing radiation of a laser beam for recording from the semiconductor laser element in accordance with the electrical signal;

light focusing means for focusing a laser beam radiated from the semiconductor laser element; and

irradiating position control means for recording data by irradiating a particular position of a light recording medium with a laser beam collected by the light collecting means, wherein:

the semiconductor laser element comprises: a substrate; a first conductivity type lower clad layer formed above the substrate; a second conductivity type upper clad layer formed above the lower clad layer, the second conductivity type being different from the first conductivity type; and an active layer provided between the lower clad layer and the upper clad layer, the element wherein,

in at least either the lower clad layer or the upper clad layer, a difference in a radiation loss of light between a basic horizontal-lateral mode and a 1st-order horizontal-lateral mode is 10 cm^{-1} or more, the light generated in the active layer, the propagation loss of light directed toward a main side of at least either the lower clad layer or the upper clad layer, the main side being opposite to an active layer side of the lower clad layer or the upper clad layer.

Claim 34 (Currently amended-withdrawn): ~~An~~ The optical data recording device according to claim 33 ~~for recording data in a light recording medium, the data provided in an electrical signal, the device comprising:~~

~~a semiconductor laser element having a ridge stripe structure for confining light in a horizontal direction;~~

~~recording light radiating control means for allowing radiation of a laser beam for recording from the semiconductor laser element in accordance with the electrical signal;~~

~~light focusing means for focusing a laser beam radiated from the semiconductor laser element; and~~

~~irradiating position control means for recording data by irradiating a particular position of a light recording medium with a laser beam collected by the light collecting means, wherein:~~

~~the semiconductor laser element comprises: a substrate; a first conductivity type lower clad layer formed above the substrate; a second conductivity type upper clad layer formed above the lower clad layer, the second conductivity type being different from the first conductivity type; and an active layer provided between the lower clad layer and the upper clad layer, the element~~ wherein,

a refractive index of at least either the lower clad layer or the upper clad layer of the semiconductor laser is below an effective index against light in a basic horizontal-lateral mode, and equal to or more than an effective index against light in a 1st-order horizontal-lateral mode, such light generated in the active layer.

Claim 35 (Original): The optical data recording device according to claim 33, further comprising:

a reproduction-only light source for radiating light for reproduction;

reproduction light radiating control means for allowing radiation of the light for reproduction from the reproduction-only light source in accordance with a reproduction command signal;

reproduction-only light focusing means for focusing light radiated from the reproduction-only light source;

reproduction light irradiating position control means for irradiating a particular position of the light recording medium with light collected by the light collecting means;

light detecting means for detecting light reflected by the light recording medium or light transmitting through the light recording medium; and

light electrical conversion means for reproducing data recorded in the light recording medium by converting an optical signal detected by the light detecting means into an electrical signal.

Claim 36 (Original): The optical data recording device according to claim 33, further comprising:

an erasing-only light source for radiating light for erasing;

erasing light radiating control means for allowing radiation of light for erasing from the erasing-only light source in accordance with an erasing command signal;

erasing-only light focusing means for focusing light radiated from the erasing-only light source; and

erasing light irradiating position control means for erasing recorded data by irradiating a particular position of a light recording medium with light collected by the light collecting means.

Claim 37 (Withdrawn): The optical data recording device according to claim 34, further comprising:

a reproduction-only light source for radiating light for reproduction;

reproduction light radiating control means for allowing radiation of the light for reproduction from the reproduction-only light source in accordance with a reproduction command signal;

reproduction-only light focusing means for focusing light radiated from the reproduction-only light source;

reproduction light irradiating position control means for irradiating a particular position of the light recording medium with light collected by the light collecting means;

light detecting means for detecting light reflected by the light recording medium or light transmitting through the light recording medium; and

light electrical conversion means for reproducing data recorded in the light recording medium by converting an optical signal detected by the light detecting means into an electrical signal.

Claim 38 (Withdrawn): The optical data recording device according to claim 34, further comprising:

an erasing-only light source for radiating light for erasing;

erasing light radiating control means for allowing radiation of light for erasing from the erasing-only light source in accordance with an erasing command signal;

erasing-only light focusing means for focusing light radiated from the erasing-only light source; and

erasing light irradiating position control means for erasing recorded data by irradiating a particular position of a light recording medium with light collected by the light collecting means.